December 5, 1991.[4] The joint parties represent heavy users of the 1.99-2.11 GHz band -- one of the bands the Commission, in its Notice of Inquiry,[5] has proposed for reallocation to PCS use.

The Joint Parties support the general concept of PCS. Indeed, the Joint Parties fully recognize the public interest benefits that might enure from such a communications system. However, for the reasons stated below -- and supported by evidence of significant investment and daily use -- the Joint Parties urge the Commission to reject the concept of reallocating any portion of the 1.99-2.11 GHz band to PCS operations. This opposition also goes to the concept of any shared allocation use among existing users and PCS.

II. THE 1.99-2.11 GHz BAND IS CURRENTLY THE SUBJECT OF HEAVY PUBLIC INTEREST USE

Already submitted in the record of this inquiry proceeding is significant evidence that the 1.99-2.11 GHz band is used heavily for mobile news gathering and program

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[4] See FCC Public Notice "Commission to Hold Hearing on Personal Communications Services (PCS)," issued November 21, 1991. In this Public Notice the Commission set January 19, 1991, as the deadline for the filing of comments on issues discussed at the hearing. On December 10, 1991, the FCC Chief Engineer adopted an "Order Extending Time for Comments" revising that comment date to today, January 9, 1992.

[5] See Notice of Inquiry in Gen. Docket No. 90-314, 5 FCC Rcd 3995 (1990).

transmission by both broadcast stations and cable television programmers. For example, in the Comments filed by NAB on October 1, 1990 (copy attached to these Joint Comments), it was pointed out that broadcasters use this frequency band for studio-to-transmitter links ("STLs"), intercity relays ("ICRs") and mobile remote pickup operations, the latter taking the form of electronic news gathering ("ENG").[6] NAB noted further that there has been a steady rise in the number of these auxiliary facilities, such that frequency coordination among these 2 GHz TV auxiliary band users was becoming increasingly more difficult.[7]

To bolster these points, NAB submitted, as an attachment to its filing, an NAB report titled "Television Auxiliary Frequency Usage Surveys," dated June 23, 1989. This report supported the view that such TV auxiliary facilities were in heavy use and concluded that the 2 GHz auxiliary band was the most heavily used. RTNDA has strongly affirmed the difficulties of ENG frequency coordination under the existing, already crowded, spectrum conditions.[8]

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[6] See Comments of NAB in Gen. Docket No. 90-314, filed October 1, 1990, at 3.

[7] Id.

[8] See RTNDA "Statement in Partial Opposition to Petition for Rulemaking" (RM-7175), filed December 18, 1989; see also Reply Comments of RTNDA in Gen. Docket No. 90-314, filed January 15, 1991.

Other video programmers, including Joint Party C-SPAN and others that currently qualify for shared use of these frequencies, also are finding that the 2 GHz auxiliary band is used heavily for their purposes, and is subject to demanding frequency coordination responsibilities with other qualified users.

In comments to be filed today by the Society of Broadcast Engineers, Inc. ("SBE"), there is additional, persuasive evidence of the extent to which these frequencies are being used for television auxiliary purposes. The SBE survey elicited information demonstrating not only heavy use of these frequencies but, as NAB further supports below, heavy investment in 2 GHz equipment and the impracticality of shifting ENG operations to other frequency bands.

The Joint Parties incorporate by reference these SBE data and other SBE evidence of ENG use and investment. These data further support the fact that these ENG frequencies are now the subject of robust and essential use by broadcasters and others eligible to use these frequencies.

Television viewers throughout the United States each day receive the benefits of such broadcast auxiliary spectrum use. As NAB explained in materials submitted in advance of the PCS hearing[9] without spectrum for ENG, local television news, as we know it, would cease to exist. And

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[9] See "Statement of the National Association of Broadcasters Regarding Spectrum Allocation Considerations for Proposed New Personal Communications Systems," ("NAB Statement") filed in Gen. Docket No. 90-314 on November 22, 1991.

for that matter, all video production reliant on 2 GHz facilities would either be halted or severely crippled were there to be a reallocation of such frequencies to PCS.

Indeed, the advent of advanced television later this decade is expected to enhance the need for these 2 GHz frequencies. If the 2 GHz ENG band is reduced or eliminated, video programmers will have to cope with the larger demands of advanced television within only the 7 and 13 GHz bands, rather than with the three bands currently employed.

III. TELEVISION STATIONS AND TELEVISION PROGRAMMERS HAVE INVESTED HEAVILY IN 2GHz EQUIPMENT

In June 1991, NAB conducted a study to examine and characterize television broadcasters' use of the 1990-2110 MHz ("2 GHz") TV auxiliary band. One specific task was to quantify the installed equipment base of 2 GHz transmitters and receivers and the economic investment made by broadcasters in 2 GHz equipment. Data was collected via a 2 GHz ENG Facilities Questionnaire mailed to all licensed television stations (excluding satellite stations) numbering approximately 1180. NAB received 635 completed and usable questionnaires representing a response rate of 53.8%. A copy of the survey instrument is attached.

The questionnaire asked for information on the number of 2 GHz transmitters and receivers owned or operated and whether those transmitters are permanently installed in ENG vehicles, configured as portable units, or installed at

fixed locations. The data was analyzed with respect to TV market size or ADI[10] in order to determine if a correlation exists between market size and the amount of equipment owned.

The results of the study indicate that 79.1% of the broadcast stations surveyed own and operate 2 GHz microwave equipment. These stations reported that they own or operate between one and 30 transmitters and between one and 18 2 GHz receivers. Approximately 25% operate at least two transmitters and another 25% operate six or more transmitters. Approximately 25% operate at least two receivers, with another 25% operating four or more receivers. The average number of 2 GHz transmitters per station is 4.5. The average number 2 GHz receivers per station is 3.6.

In order to complete the analysis, NAB estimated the value of a typical transmitting installation at approximately $19,300. Similarly, a typical receive installation's worth was estimated at approximately $23,000. Thus, the total, average, per station investment in 2 GHz equipment is $169,806. In the top 50 ADIs, the average per station equipment investment exceeds $200,000; and for one station that reports operating 30 transmission systems and 10 receive sites, the financial investment is in excess of

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[10] ADI: Area of Dominant Influence. This term is used by the Arbitron Company to describe television markets.

$800,000. In total, the stations surveyed have invested an estimated $85,083,300 in 2 GHz microwave equipment. Moreover, considering that less than 60% of broadcast stations responded to the survey, the actual industry investment is most likely in excess of 150 million dollars.

C-SPAN's investment experience is similar. According to its most recent figures, the public affairs network has approximately a quarter million dollars invested in equipment and antenna sites dedicated to service in the 2 GHz band.

NAB believes that the dollar amounts discussed are conservative figures. They do not include the engineering costs involved in the implementation of a 2 GHz microwave system, which in some instances are substantial.

Were the Commission to force TV broadcasters and other video programmers to relocate to another frequency band, the majority of the 2 GHz equipment used by stations would be rendered valueless because, in general, 2 GHz transmitters and receivers cannot be modified to operate at other frequencies. Thus, broadcasters would not only be saddled with the financial burden of purchasing new equipment when many of them are only marginally profitable,[11] but would also be forced to incur a near total loss on their existing equipment. Similar losses would be suffered by other video programmers.

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[11] See NAB/BCFM TV Financial Report, 1991.

IV. ENG OPERATIONS ARE NOT CAPABLE OF BEING SHIFTED TO OTHER AUXILIARY BANDS

As was discussed in materials already found in the record of this proceeding, ENG operations are not capable of simply being shifted to other frequency bands.[12] One reason is due to congestion. The 7 GHz (6.425-7.125 GHz) and 13 GHz (12.7-13.6 GHz) bands, which contain primarily "fixed" links, are severely congested in most markets. As a result, there simply is no room in these markets -- and these frequency bands -- for the addition of migrating ENG operations.

Moreover, there are several technical advantages that the 2 GHz frequency band has over the higher television auxiliary frequencies of 7, 13 and 40 GHz. Higher degrees of beam diffraction occur with 2 GHz signals. The 2 GHz signals break apart into multiple beams, when reflected, retaining sufficient signal strength to be useable at a distant receiver. Signals at higher frequencies, such as the 7, 13, and 40 GHz bands, tend to scatter randomly when they encounter a reflecting structure, resulting in very little usable signal at the receiver. 2 GHz signals exhibit far less scattering than the higher frequencies.

The absorption of 2 GHz signals is less than 7, 13, and 40 GHz signals. Signals in the 2 GHz range are more likely to reflect off a building or other flat surface

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[12] See e.g. NAB Statement, supra note 9; NAB Comments in Gen. Docket No. 90-314, supra note 6.

without being absorbed by metal objects on or within the building. Additionally, longer transmission distances can be achieved with 2 GHz signals than with 7, 13, or 40 GHz signals transmitted with the same power level. This, again, is due to lesser absorption and more efficient reflection of 2 GHz signals.

Another reason why shifting ENG to other frequency bands is infeasible relates to the reflective properties of 2 GHz signals, as noted above. In many cases, especially where on-the-spot coverage of news events is concerned, there may not be an unobstructed transmission path from the "remote" site to the ENG "receiver."

Broadcasters and other programmers, whose final program product must be of high technical quality, routinely rely on bouncing signals off reflecting objects in order to get a usable signal out of a shadowed area. It has been general practice since the early days of electronic new gathering to aim a transmitting antenna toward a reflecting surface at a 90 degree angle to the receiver and bounce the signal out of an otherwise "dead" area. Signals in the 2 GHz band are the only way of using this bounce mechanism effectively.

This reflecting technique, which now has become an integral part of ENG operation in urban areas, simply cannot be undertaken effectively at higher frequencies. Simply

put, ENG signals at these higher frequencies just won't bounce.

V. SUCCESSFUL IMPLEMENTATION OF PCS IS NOT DEPENDENT UPON REALLOCATION OF THE 1.99-2.11 GHz BAND

In late November and early December of 1991, around the time of the en banc hearing, there were placed into the record of this proceeding many new filings submitted by PCS proponents and other interested parties. Several of these pleadings were submitted by parties represented by panelists at the en banc hearing. Indeed, some of these pleadings consisted of the testimony of particular participants at the hearing.

Many of these parties did not distinguish among -- or address specifically -- the various segments of the 2GHz band, in terms of current use and the relative ease of reallocation. For those that did address specifically the portion of the 2GHz band most acceptable for reallocation, the vast majority did not suggest that the ENG frequencies be reallocated.

For example, Telocator[13] and American Personal Communications[14] advance specific PCS plans which would

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[13] See Report of Thomas A. Stroup, President, Telocator, on behalf of the PCS Section, filed in Gen. Docket No. 90-314 on December 5, 1991.

[14] See Statement of J. Barclay Jones, Vice President for Engineering, American Personal Communications, filed in Gen. Docket No. 90-314 on November 21, 1991.

employ frequencies below 1.99 GHz. This merit of proposing PCS frequency use below 1.99 GHz was earlier articulated well by PCN America, Inc., a subsidiary of Millicom Incorporated, in reply comments it submitted regarding its Personal Communications Network petition (RM-7175). Here PCN America stated:

> . . . Moreover, the 1990 to 2100 band was carefully considered, but use of this band has been rejected, for now, because it would be too costly to design an efficient spread spectrum PCN system that would not cause potentially unacceptable interference to existing mobile video users.[15]
>
> The PCN America reply filing went on to observe:
>
> The National Association of Broadcasters, Bonneville International Corporation, and the Radio-Television News Directors Association speculated that PCN could never coexist with their or their members' mobile electronic news gathering activities. Because our study indicates that the 1850 to 1990 MHz band provides greater flexibility for PCN design, we are not specifically proposing use of the 1990 to 2100 MHz band. The broadcast commenters' concerns, therefore, have been addressed.[16]

Indeed, our review of the recent filings into the record of this proceeding revealed only one party -- Motorola -- that specifically suggested FCC reallocation of

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[15] Reply Comments of PCN America, Inc. in RM-7175, filed January 16, 1991, at 16.

[16] Id. at n. 23.

ENG frequencies.[17] But, this lone opposition was not unexpected; for some time Motorola has expressed overall spectrum allocation goals which include not only reallocation of ENG spectrum but UHF television broadcast spectrum as well.

VI. CONCLUSION

For the reasons stated herein and in the above-referenced filings already submitted into the record of this proceeding, it is respectfully requested that the Commission, if it chooses to reallocate spectrum for implementation of the proposed personal communications system, not include within any reallocated or shared spectrum the frequencies 1.99-2.11 GHz currently employed for ENG and related video production activity.

Respectfully submitted,

NATIONAL ASSOCIATION OF BROADCASTERS
1771 N Street, N.W.
Washington, DC 20036

Henry L. Baumann
Executive Vice President and
General Counsel

Barry D. Umansky
Deputy General Counsel

[17] See, e.g. Summary of Motorola Comments Before the Federal Communications Commission PCS, En Banc Hearing, filed December 22, 1991, at 2.

Kelly T. Williams
Manager, Television Engineering
Science & Technology Department

John Marino
Manager, Technical Regulatory Affairs
Science & Technology Department

Brenda Helregel
Manager, Financial and Management Research

RADIO-TELEVISION NEWS DIRECTORS ASSOCIATION
1000 Connecticut Ave., N.W.
Washington, D.C. 20036

J. Laurent Scharff
Reed Smith Shaw & McClay
1200 - 18th Street, NW
Washington, DC 20036
Its Attorneys

CABLE-SATELLITE PUBLIC AFFAIRS NETWORK
400 North Capitol Street, Suite 650
Washington, DC 20001

Bruce Collins
Vice President & General Counsel

January 9, 1992

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	General Docket No. 90-314
Rules to Establish New Personal	)	RM-7140
Communications Services.	)	RM-7175

Comments of the
National Association of Broadcasters

The National Association of Broadcasters ("NAB")[1] submits herewith its comments in response to the Notice of Inquiry ("Notice")[2] in the above-captioned proceeding. For the reasons stated below, NAB opposes the allocation of the 1990-2110 MHz band for personal communications services. These frequencies are heavily used by broadcast television stations for mobile news gathering and program transmission.

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[1] NAB is a nonprofit incorporated association of radio and television broadcast stations and networks. NAB serves and represents America's radio and television stations and all the major networks.

[2] Notice of Inquiry in Gen. Docket No. 90-314, 5 FCC Rcd 3995 (1990).

I. Introduction.

In this proceeding, the Commission seeks to gather information that would help establish technical and regulatory policies for the implementation of new personal communication services ("PCS"). Among other things, the Notice seeks comment on where in the radio frequency spectrum the PCS should be located and how much spectrum should be allocated.

In the Notice, the Commission requests information on the feasibility of locating PCS-type systems in the 1700-2300 MHz range of the spectrum.[3] The Commission proposes relocating the current licensees of the 1710-1850 MHz, 1850-1990 MHz, 1990-2110 MHz, 2110-2200 MHz and 2200-2290 MHz bands to other places in the microwave spectrum.[4] Specifically, the Commission seeks comment on the extent of current usage in these bands and the amount of embedded equipment in use.[5]

Section 74.602 of the Commission's Rules provides for the use of the 1990-2110 MHz band for Television Broadcast Auxiliary

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[3] Id at para. 16

[4] See 47 C.F.R. Section 2.106 (The 1710-1850 MHz and 2200-2290 MHz bands are allocated for Government use. The 1850-1990 MHz band is allocated for private operational-fixed microwave (POFM) use; 1990-2110 MHz is used for television broadcast auxiliary; and 2110-2200 MHz is allocated for public fixed microwave use.)

[5] Notice at para. 21.

Stations.[6] This band is used by broadcasters for studio-to-transmitter links ("STLs"), intercity relays ("ICRs") and mobile remote pickup operations in the form of electronic news gathering ("ENG"). An STL is the vital link used by a station to carry its programming from studio to transmitter. ICRs are the fixed links which broadcasters use to send and receive programming to and from distant locations. ENG is the means by which local stations provide the public with live "on location" news and information. Portable 2 GHz ENG equipment is the backbone of broadcasters' mobile news operations.

Over the past few years, there has been a steady rise in the number of these facilities and, as a result, frequency coordination in the 2 GHz TV auxiliary band is becoming increasingly more difficult.

NAB opposes the proposed PCS use of the 1990-2100 MHz band. In these comments, NAB submits information on the extent to which the 1990-2110 MHz microwave band is used by the television broadcast industry. There are large numbers of TV auxiliary facilities licensed in this band, and in most parts of the country congestion is substantial. Broadcasters have made a significant investment in 2 GHz transmission and reception

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[6] See 47 C.F.R. Section 74.602(a). The 1990-2110 MHz frequency range is commonly referred to as the 2 GHz TV auxiliary Band.

equipment and it would be expensive and time-consuming to attempt to relocate television auxiliary operations to other frequencies. Thus, relocation of the TV auxiliary stations occupying this band could result in severe operational and financial burdens for television broadcasters.[7]

II. There is Serious Congestion in the 2 GHz Television Broadcast Auxiliary Band.

Attached, as Exhibit 1, is a report that describes two studies conducted by NAB to determine the level of congestion in the television auxiliary bands.[8] The studies show that, in the top 50 TV markets, the 2 GHz TV auxiliary band contains the highest number of ENG facilities,[9] the second highest number of STLs[10] and approximately one quarter of the ICRs in use.[11] In addition, of 67 frequency coordinators surveyed across the

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[7] At this juncture, NAB also raises concern over possible PCS use of spectrum that might otherwise be suitable for Digital Audio Broadcasting ("DAB"). Thus, at this inquiry stage of the PCS proceeding, NAB urges the Commission to consider DAB spectrum requirements as well.

[8] Dr. Ed Cohen, Television Auxiliary Frequencies Usage Surveys, Washington, D.C., National Association of Broadcasters, 1989. (Two studies were conducted. In the first, chief engineers at all television stations in the top 50 TV markets were surveyed by mail. In the second, a total of 67 frequency coordinators from large and small television markets were surveyed by phone.)

[9] Id. at 3.

[10] Id. at 2.

[11] Id. at 5.

country, 64 stated that the 2 GHz microwave band is the most heavily used for TV auxiliary transmissions in their areas[12]; and 42 stated that this band poses the most coordination problems.[13] The report also indicates that many stations may have four or more transmitters which are used for ENG (remote pickup) and an average of two ICR and/or STL links operating in the 2 GHz auxiliary band.

Thus, television broadcasters are heavy users of the 2 GHz auxiliary band. We acknowledge that, in an effort to escape congestion, some broadcasters have moved their ICRs and STLs to other TV auxiliary frequencies; however, because of the heavy investment in existing equipment, and the high cost of replacement and/or conversion, most ENG operations will continue to employ the 2 GHz range.

III. Conclusion.

Because there is heavy television auxiliary usage of the 1990-2110 MHz band, and because broadcasters have made a significant investment 2 GHz transmission equipment, relocation of TV auxiliary stations occupying this band could result in severe operational and financial burdens for broadcast television

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[12] Id. at 8.

[13] Id. at 9.

stations, with a concomitant impairment of these stations' ability to provide local programming to the public. As such, we strongly urge the Commission not to reallocate this band for PCS or any other communications service.

Respectfully submitted,

NATIONAL ASSOCIATION OF
BROADCASTERS
1771 N Street, N.W.
Washington, D.C. 20036

Michael C. Rau
Senior Vice President,
Science and Technology

Kelly T. Williams
Staff Engineer

10/1/90

Barry D. Umansky
Deputy General Counsel

October 1, 1990

EXHIBIT 1

Television Auxiliary Frequency Usage Surveys
Dr. Ed Cohen,
Director of Audience Measurment and Policy Reasearch
National Association of Broadcasting

TELEVISION AUXILIARY FREQUENCIES USAGE SURVEYS

Dr. Ed Cohen, Director of Audience Measurement and Policy Research
NAB Research and Planning
June 23, 1989

EXECUTIVE SUMMARY

Two studies were conducted to determine the level of congestion in the television auxiliary frequency bands. One study of top 50 market chief engineers detailed the level of usage in the STL, ENG, and ICR bands. The respondents considered all three bands to be congested, with the STL and ENG bands the most cluttered. In addition, requests for more frequncies in the three sets of bands are quite likely from many of the stations responding.

In a companion survey of frequency coordinators, most respondents found the 2 GHz and 7 GHz bands to be heavily used with 2 GHz posing the biggest coordination problem. About half of the markets had a home channel plan and most of the coordinators said that their job was not that difficult. About half also felt that a 9 MHz split channel ATV system could fit into the present scheme, but only a third felt that 12 MHz split channel ATV could work.

INTRODUCTION

At the request of the FCC's PS-WP3 Specialist Group on television auxiliary frequencies, NAB Research and Planning, working with NAB Science and Technology, undertook two studies. One was of chief engineers at all television stations in the top fifty ADIs. This study was conducted by mail from December, 1988 through February, 1989. Another study was conducted with 67 frequency coordinators across the country during January and February, 1989. The frequency coordinators study will be discussed in detail in another section of this report.

For the chief engineers study, two mailings were sent out to 457 stations. NAB Research and Planning received 350 filled out and usable questionnaires for a response rate of 76.6 percent. Sampling error cannot be estimated to any precise degree because this study was an attempted census of all television station chief engineers.

Three main areas of television auxiliary frequency usage were studied, specifically studio-transmitter links (STL), electronic news gathering (ENG), and intercity relays (ICR). Each will be examined separately along with a series of general questions that were asked of all respondents.

STUDIO TRANSMITTER LINKS

The vast majority of the stations in this study use broadcast auxiliary frequencies for their STLs, specifically 86 percent (302 stations). After eliminating the 48 that did not report using auxiliary frequencies for STLs, the remainder of the questions in this section will have a base of 302 stations.

A total of 140 stations (46 percent) reported having more than one link. The average number of STL links in each of the five STL bands is reported in Table 1. The heaviest amount of usage is by far in the 7 GHz band followed by 2 GHz and 13 GHz. The average length of an STL link was 14.4 miles with a standard deviation of 12.5 miles. The most common link lengths were ten and twelve miles. Only 24 stations (eight percent) reported using an active repeater on any of their STL links.

Table 1
Average STL Links Per Band

Band	Stations	Avg. Links
7 GHz	238	1.40
2 GHz	66	1.23
13 GHz	64	1.47
2.5 GHz	4	1.00
18 GHz	3	1.00

Very few stations share time on any of their STL frequencies, specifically only 28 stations (nine percent). Very few lease any "excess" capacity on their STL frequencies. Only 12 stations (four percent) reported this practice, although 99 stations (33 percent) did say that they used their STLs for other applications involving their own stations.

Of course, other methods for delivering a signal to a transmitter exist. Each engineer was asked if they used telephone lines, coaxial cable, fiber optic cable, or some other method of achieving an STL. A few do use these methods and the totals are reported in Table 2. A total of 79 stations or 22.6 percent of the total use other methods for at least one of their STL links.

All of those stations using STLs were asked about the technical quality of their STLs. Over 90 percent were satisfied with the technical quality they are receiving from the links. In addition, 87 percent use their STL facilities on a 24 hour per day basis.

Table 2
Other STL Methods

Method	Stations	Pct.
Telephone Line	32	9%
Fiber Optic	20	6
Coaxial Cable	18	5
Other Method	21	6

Many stations will need more capacity for their STL needs. A total of 128 engineers reported that their stations will definitely need more capacity in the future and another 88 stations were not sure at this point. This total of 216 stations is 62 percent stating that they will or may need more capacity in the future.

Of those who said they will need more capacity, each was asked to tell how many frequencies they will apply for in each band. The totals are shown in Table 3. Again, 7 GHz is the most popular choice with 13 GHz second in desirability. Note that 18 GHz is gaining in popularity compared to current usage patterns and that the average numbers of frequencies to be requested in the 2 GHz and 18 GHZ bands are larger than for the other bands.

Table 3
Applications for New STL Frequencies

Band	Stations	Pct.	Avg. Freqs
7 GHz	78	22%	1.70
13 GHz	63	18	1.53
2 GHz	34	10	2.21
18 GHz	31	9	2.32
2.5 GHz	9	3	1.22

ELECTRONIC NEWS GATHERING

A total of 202 stations reported using broadcast auxiliary frequencies for electronic news gathering (ENG) uses. Each one was asked how many portable microwave transmitters they use in each of the six main ENG bands. The results appear in Table 4. 13 GHz and 2 GHz are easily the most popular ENG bands.

Table 4
ENG Microwave Band Transmitters (N=202)

Band	Stations	Pct.	Avg. # of Xmtrs
2 GHz	191	95%	4.78
13 GHz	132	65	2.58
7 GHz	38	19	2.49
2.5GHz	25	12	2.12
23 GHz	11	5	1.91
40 GHz	3	1	1.00

Each user of mobile ENG transmitters was also asked how many times the units have been used in the last month, six months, and year. The figures are as follow:

Average Number of Uses:

Past Month	68.49
Six Months	335.63
Year	614.64

The average ENG mobile transmitter is operated approximately twice per day and while daily use was not measured, this is probably skewed more toward weekday than weekend usage due to greater demand for news coverage during the week.

The typical station uses a relay site for ENG, specifically three out of four respondents. The vast majority use microwave (only a handful use telephone lines or cable television systems) and Table 5 shows the popularity of the different microwave frequencies. A group of 19 respondents said they planned to use some other method to return signals from the relay site at some time in the future.

Table 5
Microwave Bands Used for ENG Relays (N=202)

Band	Stations	Pct.
7 GHZ	98	49%
13 GHz	91	45
2.5 GHz	52	26
23 GHz	24	12
2 GHz	16	8
18 GHz	5	2
40 GHz	0	2

Just over half of those stations that use ENG frequencies reported that they shared time on those frequencies with other parties in their markets. As with STL frequencies, only a few stations lease out "excess" capacity on their frequencies for nonaudio-video programming. Only ten stations reported doing this, however another 25 said they do use their frequencies for other applications for their own stations.

A large group of stations (79 percent) said they were pleased with the technical quality of their ENG frequencies.

Looking to the future, 181 engineers said they believed their stations would need more ENG capacity in the future and many plan to purchase more ENG transmitters in the short term. A group of 43 respondents said they were planning to buy one transmitter in the next year, 26 said they would probably buy two, and ten stations said they were planning to buy three or more. Fifty stations said they would buy at least one in the next two years and another 50 said they planned to buy two transmitters over that span. Another 24 stations expect to buy three or more transmitters in the next two years.

Table 6
Applications for ENG Frequencies

Band	Stations	Pct.	Avg. Freqs.
2 GHz	102	29%	3.10
13 GHz	52	15	1.52
7 GHz	35	10	1.80
23 GHz	33	9	1.55
2.5 GHz	26	7	2.23
18 GHz	19	5	1.47
40 GHz	3	1	1.33

The respondents were also asked how many ENG frequencies they will apply for in each of the bands. The results are shown in Table 6. The 2 GHz band is the most popular followed by 13 GHz and 7 GHz.

INTERCITY RELAYS (ICRs)

The third main section of the study covered stations' use of Intercity Relays (ICRs). A total of 223 stations reported using television auxiliary frequencies for ICRs including satellite dish to studio links and originating station to repeater links. This represents 65 percent of the sample. Of the 223 stations, 173 or 78 percent have multiple ICRs. The average respondent had just over five ICRs, although this figure may be inflated by some of the statewide public television networks that reported. The most common (modal) answer was two.

The average length of an ICR path was reported to be just over 28.5 miles with a standard deviation of 30 miles. The most common value was ten miles. A total of 37 percent of the stations using television auxiliary frequencies for ICRs reported that they used one or more active repeaters.

Those respondents using television auxiliary frequencies for ICRs were asked how many ICRs they have in each band. The totals are shown in Table 7. The most popular frequencies are 7 GHz and 13 GHz. A few respondents noted that their stations were also using the 23 GHz band for ICRs.

Table 7
ICR Usage By Band (N=223)

Band	Stations	Pct.	Avg. ICRs
7 GHz	157	70%	2.58
13 GHz	120	54	2.67
2 GHz	55	25	1.98
18 GHz	9	4	1.89

As with STLs and ENGs, respondents were asked about time-sharing. In the case of ICRs, 45 stations or 20 percent of those using television auxiliary frequencies for ICRs reported time-sharing of these frequencies with other parties in their areas. However, only a handful of stations (14) lease any excess capacity on ICR frequencies, although 67 report using the capacity for other purposes.

A large group of stations, 205 or 92 percent report that they are satisfied with the technical quality of their intercity relays and most of the stations (173 or 78 percent) use them on a fulltime basis. On the question of needing more capacity in the future, 146 respondents (42 percent) reported they will definitely need more ICR capacity in the near future, while 73 stations (21 percent) were unsure. Thus, a majority of all stations in the top 50 may require more ICR frequency space. As to specific frequencies to be requested, Table 8 gives the results. Again, a handful of stations reported that they would be requesting frequencies in the 23 GHz band.

Table 8
Future ICR Frequency Requests

Band	Stations	Pct.	Avg. Freqs.
7 GHz	59	17%	1.86
13 GHz	52	15	1.77
18 GHz	26	7	2.08
2 GHz	19	5	1.26

Some stations use other means to establish an ICR. Table 9 covers the results of that question.

Table 9
Other Means for ICR Connection

Medium	Stations	Pct.
Telephone Line	30	9%
Fiber Optic Cable	28	8
Coaxial Cable	13	4
Other Means	18	5

BACKUP SYSTEMS

Most of the stations reported they had some sort of backup facilities in case one of their primary facilities went down. Specifically, 185 or 53 percent said they maintained backup facilities including "hot standbys," and another 63 stations or 18 percent had contingency plans to arrange for facilities in the event of a failure. The remainder (29 percent) either do not